

The first record of the genus *Calohypsibius* Thulin, 1928 (Eutardigrada: Calohypsibiidae) from Chile (South America) with a description of a new species *Calohypsibius maliki*

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Abstract A new Calohypsibiidae, *Calohypsibius maliki* sp. nov., is described from a moss sample collected in Chile. The new species differs from others of the genus *Calohypsibius* mainly by the configuration of spines on the dorsal side of the body. The key to all *Calohypsibius* species is also provided.

Keywords Tardigrada; *Calohypsibius maliki* sp. nov.; new species; Chile; South America

INTRODUCTION

The genus *Calohypsibius* Thulin, 1928 is rarely found compared with other eutardigrades, and only four species have so far been described: *Calohypsibius ornatus* (Richters, 1900); *Calohypsibius placophorus* da Cunha, 1943; *Calohypsibius schusteri* Nelson & McGlothlin, 1996 and *Calohypsibius verrucosus* (Richters, 1900) (Guidetti & Bertolani 2005). The subspecies *Calohypsibius ornatus caelatus* (Marcus, 1928) was first elevated by Pilato et al. (1989) to the level of a fifth species, *Calohypsibius caelatus*

(Marcus, 1928), but after further examination a new genus *Fractonotus* Pilato, 1998 was erected (Pilato 1998). It is also worth mentioning that the intraspecific variability found in *C. ornatus* is extremely high (Bartos 1940; Ramazzotti & Maucci 1983), though this is probably because more than one species is grouped under this title.

The genus *Calohypsibius* is currently characterised by a rigid buccal tube with one bend in the posterior portion and without the ventral lamina. Apophyses for the stylet muscles insertion are asymmetrical in the lateral view (the ventral apophysis is in the shape of a very low ridge, while the dorsal apophysis is split into two portions: an anterior stumpy hook with a blunt caudal apex and a posterior short longitudinal thickening). The mouth opening is antero-ventral, with six peribuccal papulae. Claws (with 2-1-2-1 sequence) are small, rigid, and similar in size and shape. The claw branches are rigidly connected and the main branches have small accessory points. All known species within the genus have a small body size (up to 250.0 µm) with a distinctly sculptured dorsal cuticle with tubercles and some also with spines. Such strong sculpturing is rare among Eutardigrada (Ramazzotti & Maucci 1983; Nelson & McGlothlin 1996; Pilato & Binda 1996; Pilato 1998).

In this paper a new species *Calohypsibius maliki* sp. nov. is described and figured. A key to all known *Calohypsibius* species is also provided.

MATERIAL AND METHODS

The 12 specimens of *Calohypsibius maliki* sp. nov. were found in a moss sample collected in Bernardo O'Higgins National Park in Chile (South America).

All measurements are given in micrometers (µm). Structures were measured only if their orientations were suitable. Body length was measured from the anterior margin to the end of the body, excluding the hind legs. Buccal tube length and the level of the stylet support insertion point were measured accord-

ing to Pilato (1981). Buccal tube width was measured as the external diameter at the level of the stylet support insertion point. Claw length was measured from the base of the claw to the top of the primary/secondary branch, including accessory points. The *pt* ratio is the ratio of the length of a given structure to the length of the buccal tube expressed as a percentage (Pilato 1981). In the description of the holotype, the *pt* is given after μm value (in square brackets and in italics). All specimens were mounted in Hoyer's medium.

Photomicrographs and were made using a Phase Contrast Microscope (PCM) and Nomarski Differential Interference Contrast (DIC). Drawings were made using a *camera lucida* associated with the PCM.

TAXONOMIC ACCOUNT OF THE NEW SPECIES

Calohypsibius maliki sp. nov. (Fig. 1–6, 8)

TYPE MATERIAL: Holotype and 11 paratypes: South America, Chile, Bernardo O'Higgins National Park; 4 h by boat from Puerto Natales; *Nothofagus betuloides* forest; moss from tree; 27 Feb 2003; coll. Wojciech Niedbala.

TYPE DEPOSITORIES: Holotype (CH. 7/3) and 11 paratypes on four slides (CH. 7/3, 7/5, 7/6, 7/7) are deposited in the Natural Sciences Collection, Faculty of Biology, A. Mickiewicz University, Umultowska 89, 61-614 Poznań, Poland.

DESCRIPTION: Holotype: body length 153.0 (Fig. 1, 4–6). Body white/transparent, eyes absent or not visible after preparation. Ventral cuticle smooth. Dorsal cuticle with tubercles, ridges and spines. On lateral cuticle ridges become larger tubercles. Tubercles irregular, knob-like and star-shaped. Starting from the front of body, the sequence of sclerotised structures on the dorsal cuticle is as follows (see also Fig. 1, 4–5):

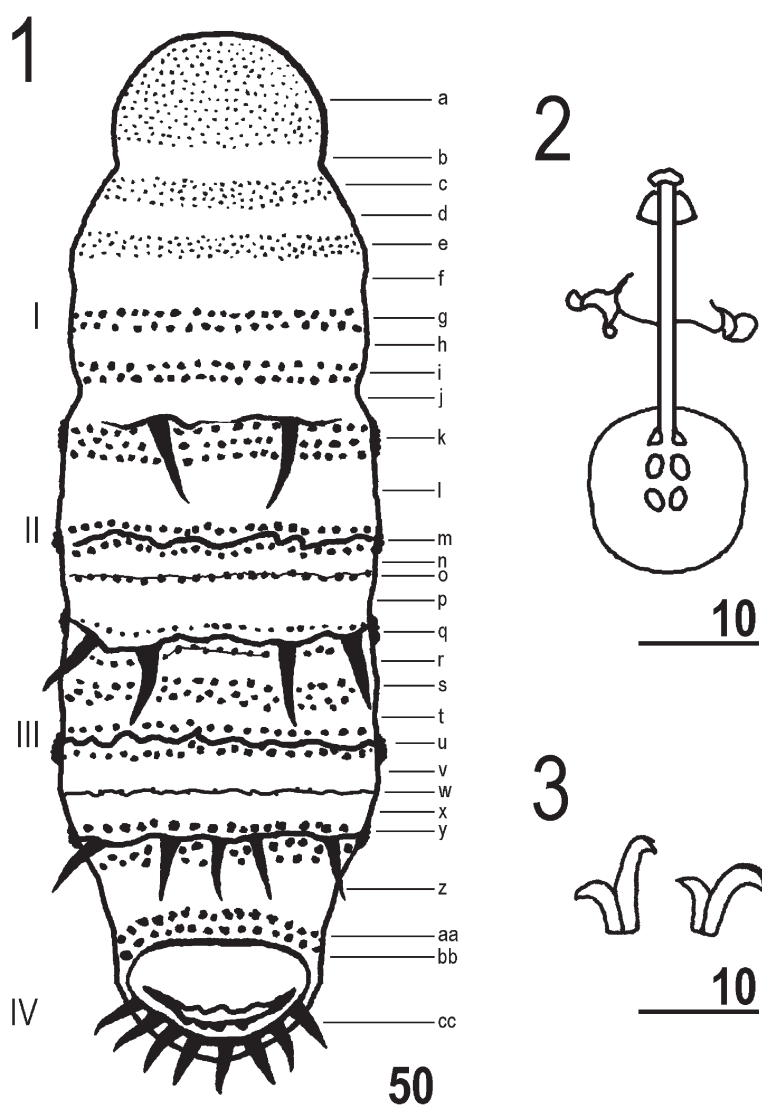
- (a) 1st band of fine tubercles (on head);
- (b) 1st band of smooth cuticle;
- (c) 2nd band of fine tubercles;
- (d) 2nd band of smooth cuticle;
- (e) 3rd band of fine tubercles;
- (f) 3rd band of smooth cuticle (just before legs I);
- (g) 1st band of large tubercles (consisting of 2 rows) (at level of legs I);
- (h) 4th band of smooth cuticle (at level of legs I);

- (i) 2nd band of large tubercles (consisting of 2 rows, just after legs I);
- (j) 5th band of smooth cuticle (between legs I and II);
- (k) 1st ridge with 2 spines (between legs I and II) and 3rd band of large tubercles (consisting of 3 rows, before legs II);
- (l) 6th band of smooth cuticle (just before legs II);
- (m) 4th band of large tubercles (1 row), 2nd ridge and 5th band of large tubercles (1 row) (at level of legs II);
- (n) 7th, narrow band of smooth cuticle (at level legs II);
- (o) 3rd ridge with 6th band of large tubercles (1 row) (just after legs II);
- (p) 8th band of smooth cuticle;
- (q) 7th band of large tubercles (1 row), 4th ridge (with 4 spines) and 8th band of large tubercles (1 row) (between legs II and III);
- (r) 9th, narrow band of smooth cuticle (before legs III);
- (s) 9th band of large tubercles (3 rows) (just before legs III);
- (t) 10th, narrow band of smooth cuticle (at level of legs III);
- (u) 10th band of large tubercles (1 row), 5th ridge and 11th band of large tubercles (1 row) (at level of legs III);
- (v) 11th, narrow band of smooth cuticle (at level of legs III);
- (w) 6th ridge (just behind I legs III);
- (x) 12th, narrow band of smooth cuticle (just behind legs III);
- (y) 12th band of large tubercles (1 row), 7th ridge (with 5 spines) and 13th band of tubercles (2 rows) (between legs III and IV);
- (z) 13th band of smooth cuticle;
- (aa) 14th band of large tubercles (2 rows) (between legs III and IV);
- (bb) 8th ridge (before legs IV);
- (cc) 9th ridge (with 8 spines) (at level of legs IV).

The eighth and ninth ridges are connected laterally to form a terminal plate. In a particular row, the spines have similar lengths. The length of spines decreases caudally, while their number in a row increases caudally (Fig. 1, 8). First row with 2 spines (15.2 [78.0] long), second with 4 (10.9 [56.1] long), third with 5 (10.0 [51.2] long) and fourth with 8 (9.0 [46.3] long).

Peribuccal lamellae absent. Peribuccal papulae not visible in PCM (but probably present). Bucco-pharyngeal apparatus without ventral lamina.

Fig. 1–3 *Calohypsibius maliki* sp. nov. **1**, habitus, semi-schematic drawing of the dorsal cuticle (Roman numbers on the left side indicate leg levels and letters on the right side correspond with the numbering letters in the species description; **2**, buccal apparatus; **3**, claws of the IV pair of legs.



Buccal tube 19.5 long and 1.4 [7.3] wide. At posterior end of buccal tube, pharyngeal apophyses are present. Stylet supports inserted on buccal tube at 10.0 [51.2]. Walls of buccal tube not thickened posteriorly to insertion of stylet supports. Pharyngeal bulb oval with two rounded macroplacoids, first 2.4 [12.2] long and second, shorter, 1.4 [7.3] long. Microplacoid and septulum absent. Macroplacoid row 4.8 [24.4] long.

Claws small, *Calohypsibius* type. Primary branch (pb.) of basal claw on legs I, 3.8 [19.5] long, secondary branch (sb.) 2.2 [11.2] long; legs II, pb. 3.8 [19.5], sb. 2.4 [12.2]; legs III, pb. 3.8 [19.5], sb. 2.9

[14.6]; legs IV, pb. 4.8 [24.4], sb. 3.0 [15.6]. Lunules and other cuticular structures on legs absent.

Eggs unknown.

REMARKS: The number of spines increases caudally, i.e., in one specimen the number of spines in row x is always equal or lower than in row $x+1$ (see Fig. 8 and Tables 1–2). The mode values for the consecutive rows are: 2, 4, 5, and 8 (12 specimens). Although the number of rows with spines is always four, spines may be broken or weakly developed. Also, some ridges and bands of tubercles may not be fully developed or invisible due to an unfavourable reaction during fixation of the specimens.

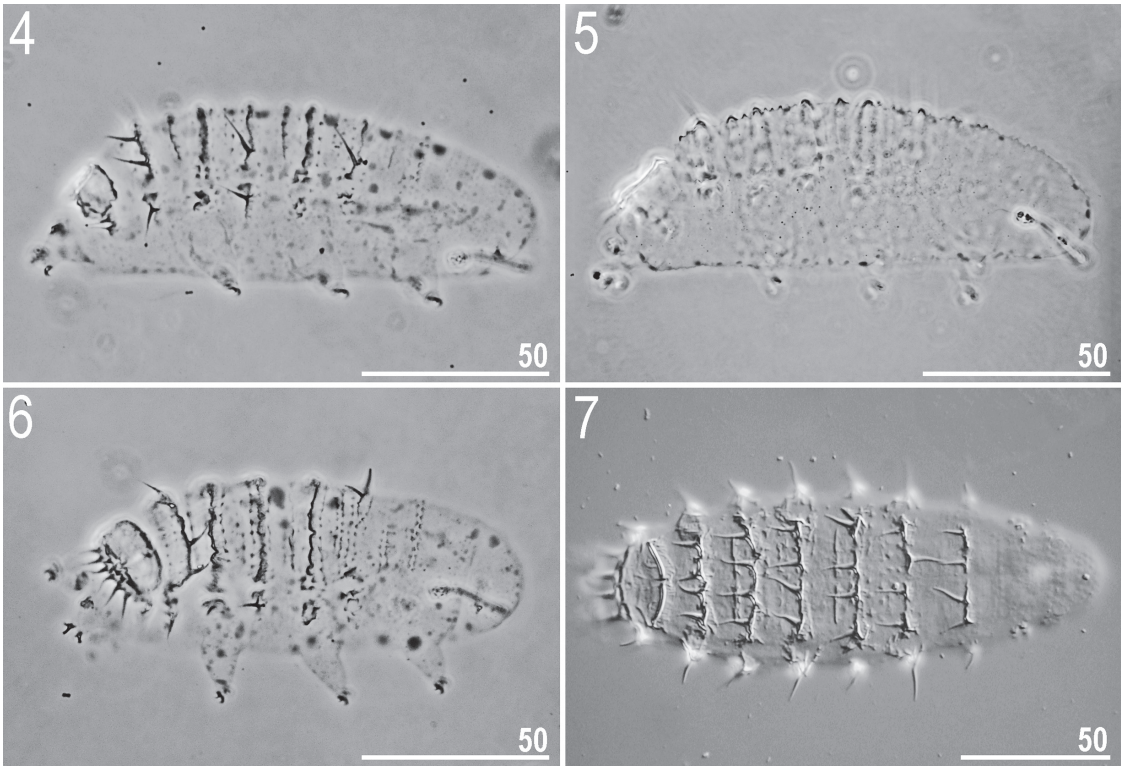


Fig. 4–7 4–6, *Calohypsibius maliki* sp. nov.—habitus (4, lateral view; 5, middle section; 6, dorso-lateral view); 7, *Calohypsibius ornatus*—habitus (dorsal view, specimen from the Bieszczady Mountains, Poland, from Michalczyk & Kaczmarek 2003) (4–6, PCM; 7, DIC).

Results of simple statistical analysis of measurements and *pt* values of selected morphological structures for 10 specimens are given in Table 1. Measurements of the smallest and largest specimens are provided in Table 2.

ETYMOLOGY: We dedicate this species to the first author’s dear friend Magda ‘*mm*’ Malik.

Differential diagnosis

The new species is most similar to *Calohypsibius ornatus* which has spines arranged in seven or eight rows (Fig. 7), while the new species has only four rows of spines. This character makes *Calohypsibius maliki* sp. nov. easily distinguishable among all described species within the genus.

KEY TO THE KNOWN *CALOHYPSIBIUS* SPECIES

- 1 Dorsal cuticle with spines.....2
- Dorsal cuticle without spines3
- 2 Spines arranged in 7–8 transverse rows *C. ornatus*
- Spines arranged in 4 transverse rows *C. maliki* sp. nov.
- 3 Dorsal cuticle covered with tubercles and plates4
- Dorsal cuticle without plates, covered with tubercles arranged in 12 transverse rows..... *C. schusteri*
- 4 Dorsal cuticle covered with tubercles that occasionally merge into small plates *C. verrucosus*
- Dorsal cuticle covered with plates arranged in 6–7 transverse rows, symmetrical to the median line....
..... *C. placophorus*

Fig. 8 *Calohypsibius maliki* sp. nov. Means \pm SE for the differences in the lengths (filled circles and solid line) and the number (open circles and dashed line) of spines in the consecutive rows on the dorsal cuticle. $N = 12$.

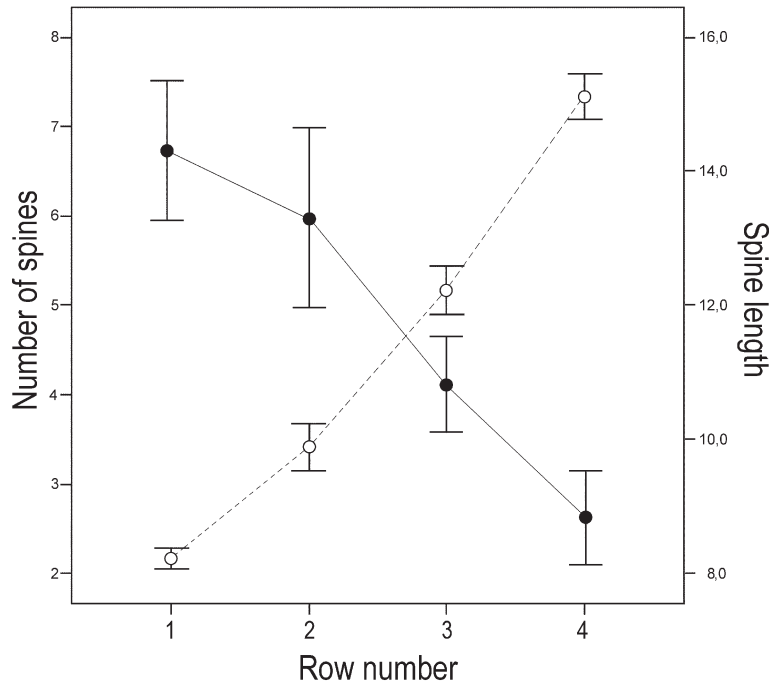


Table 1 Measurements (in μm) and pt values of selected morphological structures of specimens of *Calohypsibius maliki* sp. nov. mounted in Hoyer's medium (min. and max. refer to the smallest and the largest structure/number found among all measured specimens; N = number of specimens/structured measured).

Character	N	Range		Mean		SD	
		(μm)	(pt)	(μm)	(pt)	(μm)	(pt)
Body	10	123.5–153.9	647.6–785.4	140.98	711.71	9.98	47.86
Buccal tube	10	16.2–21.4	–	19.86	–	1.45	–
Stylet support insertion point	9	7.6–10.5	43.9–51.2	9.55	48.10	0.93	2.06
Buccal tube external width	10	1.2–1.7	6.2–8.2	1.42	7.14	0.13	0.54
Macroplacoid 1	10	1.4–2.4	6.8–12.2	1.90	9.65	0.32	1.93
Macroplacoid 2	10	1.2–1.9	6.8–8.9	1.48	7.46	0.19	0.72
Placoid row	10	3.8–4.8	18.2–24.4	4.23	21.36	0.35	1.93
Claw 1—primary branch	10	3.3–3.8	17.1–23.5	3.75	19.00	0.15	1.75
Claw 1—secondary branch	9	1.9–2.2	8.9–11.8	1.93	9.80	0.09	1.01
Claw 2—primary branch	10	3.8–4.3	17.8–23.5	3.90	19.70	0.20	1.64
Claw 2—secondary branch	10	1.9–2.4	8.9–12.2	1.95	9.87	0.15	1.15
Claw 3—primary branch	8	3.8–4.3	17.8–23.5	3.86	19.69	0.17	1.82
Claw 3—secondary branch	8	1.9–2.9	8.9–14.6	2.02	10.31	0.34	1.96
Claw 4—primary branch	8	3.8–4.8	18.2–26.5	4.39	22.42	0.42	2.74
Claw 4—secondary branch	8	1.9–3.0	9.1–15.6	2.22	11.29	0.48	2.32
Spine of row 1 length	10	8.6–19.0	51.2–88.9	14.30	71.61	3.32	14.03
Spine of row 2 length	8	6.7–18.1	41.2–86.4	13.30	66.74	3.79	15.13
Spine of row 3 length	9	6.7–13.3	41.2–66.7	10.82	54.32	2.15	8.31
Spine of row 4 length	10	5.7–13.3	41.2–66.7	8.84	54.32	2.23	8.31
No. of spines in row 1	12	2–3	–	2.2	–	0.4	–
No. of spines in row 2	12	2–4	–	3.4	–	0.9	–
No. of spines in row 3	12	4–7	–	5.2	–	0.9	–
No. of spines in row 4	12	5–8	–	7.3	–	0.9	–

Table 2 Measurements (μm) and *pt* values of selected morphological structures of the smallest and the largest found specimens of *Calohypsibius maliki* sp. nov. mounted in Hoyer's medium.

Character	μm	<i>pt</i>	μm	<i>pt</i>
Body	123.5	764.7	153.0	785.4
Buccal tube	16.2	—	19.5	—
Stylet support insertion point	7.6	47.1	10.0	51.2
Buccal tube external width	1.2	7.6	1.4	7.3
Macroplacoid 1	1.9	11.8	2.4	12.2
Macroplacoid 2	1.2	7.6	1.4	7.3
Placoid row	3.8	23.5	4.8	24.4
Claw 1—primary branch	3.8	23.5	3.8	19.5
Claw 1—secondary branch	1.9	11.8	2.2	11.2
Claw 2—primary branch	3.8	23.5	3.8	19.5
Claw 2—secondary branch	1.9	11.8	2.4	12.2
Claw 3—primary branch	3.8	23.5	3.8	19.5
Claw 3—secondary branch	1.9	11.8	2.9	14.6
Claw 4—primary branch	4.3	26.5	4.8	24.4
Claw 4—secondary branch	1.9	11.8	3.0	15.6
Spines of row 1 length	8.6	52.9	15.2	78.0
Spines of row 2 length	6.7	41.2	10.9	56.1
Spines of row 3 length	6.7	41.2	10.0	51.2
Spines of row 4 length	5.7	35.3	9.0	46.3
No. of spines in row 1	2	—	2	—
No. of spines in row 2	3	—	4	—
No. of spines in row 3	5	—	5	—
No. of spines in row 4	8	—	8	—

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